CLAIMS

What we claim is:

1. An automated optimization computing system of the type for optimization of models based on input data input into the system, the optimization computing system comprising in combination:

A. a main user interface system having at least one input data entry screen, an optimized model viewing screen, a data exporting facility, and a data importing facility; and

B. a separate optimizing subsystem in communication with the main interface system to accept said input data from the data exporter of the main module, run an optimization algorithm utilizing the accepted input data, and provide optimized model data to the main user interface system;

whereby the main module system may optionally run on a first computer, the optimizing system may optionally run on a second computer distal from the first computer, and thereby: (i) the main user interface system optionally may remotely provide said input data to the optimizing subsystem, (ii) the optimizing subsystem optionally may remotely generate optimized model data utilizing said input data, and (iii) the main user interface system may remotely display an optimized model based on said optimized model data provided by the optimizing subsystem.

2. The automated optimization system of claim 1 also including a viewable optimization processing status indicator on a screen, whereby the user may view the status indicator on the screen.

3. The automated optimization system of claim 1 also including a model data file exporter, whereby the optimization computing system stores model data in a file with a unique name and preferably does not overwrite other model data files.

4. The automated optimization system of claim 1 wherein the main module system includes a graphical user interface providing a plurality of differing views of data including a graphical optimized model screen.

5. The automated optimization system of claim 1 wherein the main user interface system includes (i) a presenting screen, whereby the user may selectively alter optimized model data; and (ii) a re-optimization selector in communication with the optimizing subsystem, whereby the altered and confined optimized model data may be provided to the optimizing subsystem for re-optimization subject to the constraints in the altered optimized model data.

6. The automated optimization system of claim 3 wherein the main user interface system includes (i) a presenting screen, whereby the user may selectively alter optimized model data; and (ii) a re-optimization selector in communication with the optimizing subsystem, whereby the altered optimized model data may be provided to the optimizing subsystem for re-optimization subject to the constraints in the altered and confined optimized model data.

7. The automated optimization system of claim 4 wherein the main user interface system includes (i) a presenting screen, whereby the user may selectively alter said input data; and (ii) a re-optimization selector in communication with the optimizing subsystem, whereby the altered input data may be provided to the optimizing subsystem for re-optimization subject to the altered input data.

8. The automated optimization system of claim 1 also including an optimization run-time estimator display, whereby an estimate of the run-time for an optimization of said input data by said optimizing subsystem can be displayed.

9. The automated optimization system of claim 1 also including a sampling plot display, whereby the effectiveness of the sampling technique for procuring said input data can be displayed.

10. The automated optimization system of claim 1 wherein the said optimization subsystem includes a parallelizable optimizing algorithm, whereby the optimizing algorithm may run in parallel on multiple computer processors.

11. The automated optimization system of claim 2 wherein the said optimization subsystem includes a parallelizable optimizing algorithm, whereby the optimizing algorithm may run in parallel on multiple computer processors.

12. The automated optimization system of claim 3 wherein the said optimization subsystem includes a parallelizable optimizing algorithm, whereby the optimizing algorithm may run in parallel on multiple computer processors.

13. The automated optimization system of claim 4 wherein the said optimization subsystem includes a parallelizable optimizing algorithm, whereby the optimizing algorithm may run in parallel on multiple computer processors.

14. The automated optimization system of claim 5 wherein the said optimization subsystem includes a parallelizable optimizing algorithm, whereby the optimizing algorithm may run in parallel on multiple computer processors.

15. The automated optimization system of claim 6 wherein the said optimization subsystem includes a parallelizable optimizing algorithm, whereby the optimizing algorithm may run in parallel on multiple computer processors.

16. The automated optimization system of claim 7 wherein the said optimization subsystem includes a parallelizable optimizing algorithm, whereby the optimizing algorithm may run in parallel on multiple computer processors.

17. The automated optimization system of claim 8 wherein the said optimization subsystem includes a parallelizable optimizing algorithm, whereby the optimizing algorithm may run in parallel on multiple computer processors.

18. The automated optimization system of claim 9 wherein the said optimization subsystem includes a parallelizable optimizing algorithm, whereby the optimizing algorithm may run in parallel on multiple computer processors.

19. The automated optimization system of claim 1 wherein the input data is seismic data and the optimized model data is seismic optimized model data.

20. The automated optimization system of claim 4 wherein the input data is seismic data and the optimized model data is seismic optimized model data.

21. The automated optimization system of claim 5 wherein the input data is seismic data and the optimized model data is seismic optimized model data.

22. The automated optimization system of claim 9 wherein the input data is seismic data and the optimized model data is seismic optimized model data.

23. The automated optimization system of claim 10 wherein the input data is seismic data and the optimized model data is seismic optimized model data.

24. The automated optimization system of claim 15 wherein the input data is seismic data and the optimized model data is seismic optimized model data.

25. The automated optimization system of claim 8 wherein the said optimization subsystem includes a parallelizable optimizing algorithm, whereby the optimizing algorithm may run in parallel on multiple computer processors.

26. An automated optimization computing system of the type for optimization of models based on input data input into the system, the optimization computing system comprising in combination:

A. a first computing system including a main interface system having at least one input data entry screen, an optimized model viewing screen, a data exporting facility, and a data importing facility; and

B. a second computing system distal from and selectably connected to said first computing system, said second computing system including a separate optimizing subsystem in communication with the main interface system to accept said input data from the data exporter of the main module, run an optimization algorithm utilizing the accepted input data, and provide optimized model data to the main interface system;

whereby the main interface system may optionally run on a first computer, the optimizing system may optionally run on a second computer distal from the first computer, and thereby: (i) the main module optionally may remotely provide said input data to the optimizing subsystem, (ii) the optimizing subsystem optionally may remotely generate optimized model data utilizing said input data, and (iii) the main interface system may remotely display an optimized model based on said optimized model data provided by the optimizing subsystem.

27. The automated optimization computing system of claim 22 wherein the selectable connection between the first computing system and the second computing system includes an Internet link.

28. The automated computing system of claim 22 wherein the selectable connection between the first computing system and the second computing system includes a wireless link.

29. The automated computing system of claim 22 wherein the selectable connection between the first computing system and the second computing system includes an intranet link.

30. The automated computing system of claim 22 wherein the second computing system includes a plurality of separate computers interconnected on a local area network and wherein the or another algorithm may run in parallel on said plurality of separate computers.

31. The automated computing system of claim 22 wherein the input data comprises seismic data and the optimized model data comprises optimized seismic model data.

32. The automated computing system of claim 23 wherein the input data comprises seismic data and the optimized model data comprises optimized seismic model data.

33. The automated computing system of claim 24 wherein the input data comprises seismic data and the optimized model data comprises optimized seismic model data.

34. The automated computing system of claim 25 wherein the input data comprises seismic data and the optimized model data comprises optimized seismic model data.

35. The automated computing system of claim 26 wherein the input data comprises seismic data and the optimized model data comprises optimized seismic model data.

36. An automated method of utilizing at least one computer to automatically generate an optimized outcome based on input data, said method comprising the steps of:

A. accessing said input data, providing the input data as input to at least one optimization algorithm, and running said at least one optimization algorithm on said at least one computer to provide a plurality of optimized model outcomes from the said input data;

B. automatically applying at least a second algorithm on said at least one computer and thereby automatically choosing one among the optimized outcomes according to predetermined criteria applied by said at least second algorithm; and

C. displaying the chosen one optimized outcome on a viewing screen.

37. The automated optimization method of claim 32 wherein the second algorithm comprises choosing the one among the optimized outcomes that presents the most globally optimized result.

38. The automated optimization method of claim 32 wherein said at least one algorithm comprises a parallizable algorithm, whereby said parallelizable algorithm may run on a plurality of computer processors in parallel.

39. The automated optimization method of claim 33 wherein said at least one algorithm comprises a genetic optimization algorithm.

40. The automated optimization method of claim 34 wherein said at least one algorithm comprises a genetic optimization algorithm.

41. The automated optimization method of claim 32 wherein: step A includes running said at least one optimization algorithm on at least a first computer; and step C includes transmitting at least a substantial portion of said optimized outcome to a second computer distal from and in communication with said first computer to thereby display said substantial portion of said optimized outcome on a screen associated with said second computer.

42. The automated optimization method of claim 33 wherein: step A includes running said at least one optimization algorithm on at least a first computer; and step C includes transmitting at least a substantial portion of said optimized outcome to a second computer distal from said first computer to thereby display said substantial portion of said optimized outcome on a screen associated with said second computer.

43. The automated optimization method of claim 34 wherein: step A includes running said at least one optimization algorithm on at least a first computer; and step C includes transmitting at least a substantial portion of said optimized outcome to a second computer distal from and in communication with said first computer to thereby display said substantial portion of said optimized outcome on a screen associated with said second computer.

44. The automated optimization method of claim 35 wherein: step A includes running said at least one optimization algorithm on at least a first computer; and step C includes transmitting at least a substantial portion of said optimized outcome to a second computer distal from said first computer to thereby display said substantial portion of said optimized outcome on a screen associated with said second computer.

45. The automated optimization method of claim 36 wherein: step A includes running said at least one optimization algorithm on at least a first computer; and step C includes transmitting at least a substantial portion of said optimized outcome to a second computer distal from and in communication with said first computer to thereby display said substantial portion of said optimized outcome on a screen associated with said second computer.

46. An automated method of utilizing at least two computing systems to automatically generate an optimized outcome based on input data, said method comprising the steps of:

A. accessing said input data, providing the input data as input to at least one optimization algorithm, and running said at least one optimization algorithm on a first computing system to provide a plurality of optimized model outcomes from the said input data;

B. automatically running at least a second algorithm on said first computing system and thereby automatically choosing one among the optimized outcomes according to predetermined criteria applied by said at least second algorithm; and

C. displaying the chosen one optimized outcome on a viewing screen on a second computing system distal from and selectably connected to said first computing system.

47. The automated method of claim 42 wherein at least the one optimizing algorithm is a parallelizable algorithm, whereby the one algorithm may run simultaneously on independent computer processors.

48. The automated method of claim 42 wherein the first computing system is connected to the second computing system by an Internet link.

49. The automated method of claim 42 wherein the first computing system is connected to the second computing system by a wireless link.

50. The automated method of claim 42 wherein the first computing system is connected to the second computing system by a intranet link.

51. The automated method of claim 44 wherein the second computing system includes a plurality of computers interconnected on a local area network and wherein the or another algorithm may run in parallel on said plurality of computers.

52. The automated method of claim 42 wherein the input data comprises seismic input data and the optimized outcomes comprise optimized seismic models

53. The automated method of claim 43 wherein the input data comprises seismic input data and the optimized outcomes comprise optimized seismic models

54. The automated method of claim 44 wherein the input data comprises seismic input data and the optimized outcomes comprise optimized seismic models

55. The automated method of claim 45 wherein the input data comprises seismic input data and the optimized outcomes comprise optimized seismic models

56. The automated method of claim 46 wherein the input data comprises seismic input data and the optimized outcomes comprise optimized seismic models

57. The automated method of claim 47 wherein the input data comprises seismic input data and the optimized outcomes comprise optimized seismic models

58. A method of generating an optimized model of a physical system based on empirical input data, the method comprising the steps of:

A. acquiring the empirical input data by recording physical characteristics of the physical system in the field;

B. recording the empirical input data in a computer memory;

C. utilizing the empirical input data as input to an optimization algorithm running on a computer and thereby generating the optimized model of the physical system;

D. displaying the optimized model on a viewing screen;

E. altering aspects of the optimized model on said viewing screen; and

F. providing the altered elements as constraint input to the or another optimization algorithm and thereby generating a constrained optimized model of the physical system; and

G. displaying the constrained optimized model on the or another viewing screen.

59. The method of generating an optimized model of claim 54 wherein the or another optimizing algorithm is a parallelizable algorithm, whereby the or another algorithm may run simultaneously on independent computer processors.

60. The method of generating an optimized model of claim 54 wherein at least one among the data recording step B, the data displaying steps D and G, and the data altering steps substantially occur on a first computing system distal but in communication with a second computing system distal from said first computing system, with said utilizing step C and providing step F substantially occurring on said second computing system.

61. The method of generating an optimized model of claim 56 wherein the first computing system is connected to the second computing system by an Internet link.

62. The method of generating an optimized model of claim 56 wherein the first computing system is connected to the second computing system by a wireless link.

63. The method of generating an optimized model of claim 56 wherein the first computing system is connected to the second computing system by an intranet link.

64. The method of generating an optimized model of claim 57 wherein the second computing system includes a plurality of computers interconnected on a local area network and wherein the or another algorithm may run in parallel on said plurality of computers.

65. An automated method of utilizing at least one computer to automatically generate an optimized outcome based on input data, said method comprising the steps of:

A. Accessing said input data, providing the input data as input to at least one optimization algorithm, and running said at least one optimization algorithm on said at least one computer to provide a plurality of optimized model outcomes from the said input data;

B. averaging the plurality of optimized model outcomes to provide an averaged optimized model outcome; and

C. displaying the averaged optimized model outcome on a viewing screen.

66. The automated method of claim 61 wherein the number of optimized outcomes to be averaged is determined automatically based on the number of iterations run by the optimization algorithm to generate a single optimized model outcome among the plurality of outcomes.

67. The automated method of claim 61 wherein (i) the method also includes the steps of re-running said at least one optimization algorithm and re-averaging the plurality of model outcomes to generate a plurality of averaged optimized model outcomes, and then applying a second algorithm to select the one among the plurality of averaged optimized model outcomes that presents the most globally optimized result; and (ii) the displaying step displays the most globally optimized result on said viewing screen.

68. The automated method of claim 61 wherein said at least one optimization algorithm comprises a parallizable algorithm, whereby said parallelizable algorithm may run on a plurality of computer processors in parallel.

69. The automated method of claim 61 wherein said at least one optimization algorithm comprises a genetic optimization algorithm.

70. The automated method of claim 64 wherein said at least one optimization algorithm comprises a genetic optimization algorithm.

71. The automated method of claim 61 wherein: step A includes running said at least one optimization algorithm on at least a first computer; and step C includes transmitting at least a substantial portion of said averaged optimized model outcome to a second computer distal from and in communication with said first computer to thereby display said substantial portion of said averaged optimized model outcome on a screen associated with said second computer.

72. The automated method of claim 62 wherein: step A includes running said at least one optimization algorithm on at least a first computer; and step C includes transmitting at least a substantial portion of said averaged optimized model outcome to a second computer distal from said first computer to thereby display said substantial portion of said averaged optimized model outcome on a screen associated with said second computer.

73. The automated method of claim 63 wherein: step A includes running said at least one optimization algorithm on at least a first computer; and step C includes transmitting at least a substantial portion of said globally optimized result to a second computer distal from and in communication with said first computer to thereby display said substantial portion of said globally optimized result on a screen associated with said second computer.

74. The automated method of claim 64 wherein: step A includes running said at least one optimization algorithm on at least a first computer; and step C includes transmitting at least a substantial portion of said averaged optimized model outcome to a second computer distal from said first computer to thereby display said substantial portion of said averaged optimized model outcome on a screen associated with said second computer.

75. The automated method of claim 65 wherein: step A includes running said at least one optimization algorithm on at least a first computer; and step C includes transmitting at least a substantial portion of said averaged optimized model outcome to a second computer distal from and in communication with said first computer to thereby display said substantial portion of said averaged optimized model outcome on a screen associated with said second computer.

76. The automated method of claim 61 wherein the input data comprises seismic data acquired from empirical testing in a geographical region and each optimized model outcome comprises an optimized model of seismic characteristics of said region.

77. The automated method of claim 62 wherein the input data comprises seismic data acquired from empirical testing in a geographical region and each optimized model outcome comprises an optimized model of seismic characteristics of said region.

78. The automated method of claim 63 wherein the input data comprises seismic data acquired from empirical testing in a geographical region and each optimized model outcome comprises an optimized model of seismic characteristics of said region.

79. The automated method of claim 64 wherein the input data comprises seismic data acquired from empirical testing in a geographical region and each optimized model outcome comprises an optimized model of seismic characteristics of said region.

80. The automated method of claim 65 wherein the input data comprises seismic data acquired from empirical testing in a geographical region and each optimized model outcome comprises an optimized model of seismic characteristics of said region.

81. The automated method of claim 66 wherein the input data comprises seismic data acquired from empirical testing in a geographical region and each optimized model outcome comprises an optimized model of seismic characteristics of said region.

82. The automated method of claim 67 wherein the input data comprises seismic data acquired from empirical testing in a geographical region and each optimized model outcome comprises an optimized model of seismic characteristics of said region.

83. The automated method of claim 68 wherein the input data comprises seismic data acquired from empirical testing in a geographical region and each optimized model outcome comprises an optimized model of seismic characteristics of said region.

84. The automated method of claim 69 wherein the input data comprises seismic data acquired from empirical testing in a geographical region and each optimized model outcome comprises an optimized model of seismic characteristics of said region.

85. The automated method of claim 70 wherein the input data comprises seismic data acquired from empirical testing in a geographical region and each optimized model outcome comprises an optimized model of seismic characteristics of said region.

86. The automated method of claim 71 wherein the input data comprises seismic data acquired from empirical testing in a geographical region and each optimized model outcome comprises an optimized model of seismic characteristics of said region.

87. An automated optimization computing system of the type for optimization of models based on input data input into the system, the optimization computing system comprising in combination:

A. an optimizing system loadable onto a first computing system having an optimization algorithm providing optimized model data based on input data provided to the optimizing system;

B. an automatic data transfer system loadable on a second computer distal from the optimizing system and in communication with the optimizing system;

whereby: (i) the automatic data transfer system remotely provides said input data to the optimizing system, (ii) the optimizing system remotely generates optimized model data utilizing said input data, and (iii) the automatic data transfer system may remotely display an optimized model based on said optimized model data provided by the optimizing system.

88. The automated optimization computing system of claim 83 wherein the automatic data transfer system includes a Internet web browser compatible interface.

89. The automated optimization computing system of claim 84 wherein the communication between the automatic data transfer system and the optimizing system is provided by a link through the Internet.

90. A method of generating an optimized model of a seismic field based on empirical seismic data collected from a geophone array in the seismic field, the method comprising the steps of:

A. recording the empirical input data in a computer memory;
B. utilizing the empirical input data as input to an optimization algorithm running on an optimizing computer and thereby generating the optimized model of the physical system;
C. displaying the optimized model on a viewing screen;
D. altering aspects of the optimized model on said viewing screen; and
E. providing the altered elements as constraint input to the or another optimization algorithm and thereby generating a constrained optimized model of the physical system; and
F. displaying the constrained optimized model on the or another viewing screen.

91. The method of claim 86 wherein recording step also includes accessing the optimizing computer remotely and automatically transferring the recorded empirical input data to the optimizing computer.

92. A method of providing optimization services to a remote user having a remote computing system, the method including the steps of:

A. providing an optimization computing system having an optimizing system including an optimization algorithm;

B. providing the remote user with remote access to the optimization computing system;

C. accepting input data from the remote user at the optimization computing system through a communication link between the remote user and optimization computing system;

D. utilizing the input data and generating an optimized model with the optimizing system on the optimization computing system; and

E. providing the remote user with access to information regarding the optimized model.

93. The optimization service method of claim 88 wherein the method also includes the step of charging the user a fee for services or one or more systems provided to the user in connection with performing the method.

94. The optimization service method of claim 88 wherein the communication link includes the Internet and the remote user transfers input data to the optimization computing system through at least a portion of a web browser running on a remote user computing system.